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waste landfill, a RCRA Subtitle C hazardous waste landfill, or a TSCA hazardous waste landfill, in which industrial solid waste, such as RCRA Subtitle D wastes (non-hazardous industrial solid waste, defined in 40 CFR 257.2), commercial solid wastes, or conditionally exempt small quantity generator wastes, is placed. An industrial waste landfill includes all disposal areas at the facility.

(c) This source category does not include:

(1) Construction and demolition waste landfills.

(2) Industrial waste landfills that only receive one or more of the following inert waste materials:

(i) Coal combustion or incinerator ash (*e.g.*, fly ash).

(ii) Cement kiln dust.

(iii) Rocks and/or soil from excavation and construction and similar activities.

(iv) Glass.

(v) Non-chemically bound sand (*e.g.*, green foundry sand).

(vii) Clay, gypsum, or pottery cull.

(viii) Bricks, mortar, or cement.

(ix) Furnace slag.

(x) Materials used as refractory (*e.g.*, alumina, silicon, fire clay, fire brick).

(xi) Plastics (*e.g.*, polyethylene, polypropylene, polyethylene terephthalate, polystyrene, polyvinyl chloride).

(xii) Other waste material that has a volatile solids concentration of 0.5 weight percent (on a dry basis) or less.

(xiii) Other waste material that has a DOC value of 0.3 weight percent (on a wet basis) or less. DOC value must be determined using a 60-day anaerobic biodegradation test procedure identified in § 98.464(b)(4)(i).

(d) This source category consists of the following sources at industrial waste landfills: Landfills, gas collection systems at landfills, and destruction devices for landfill gases (including flares).

[75 FR 39773, July 12, 2010, as amended at 76 FR 73907, Nov. 29, 2011, 77 FR 51495, Aug. 24, 2012; 78 FR 71979, Nov. 29, 2013]

§ 98.461 Reporting threshold.

You must report GHG emissions under this subpart if your facility contains an industrial waste landfill meeting the criteria in § 98.460 and the facility meets the requirements of § 98.2(a)(2). For the purposes of § 98.2(a)(2), the emissions from the industrial waste landfill are to be determined using the methane generation corrected for oxidation as determined using Equation TT–6 of this subpart times the global warming potential for methane in Table A–1 of subpart A of this part.

§ 98.462 GHGs to report.

(a) You must report CH_4 generation and CH_4 emissions from industrial waste landfills.

(b) You must report CH_4 destruction resulting from landfill gas collection and destruction devices, if present.

(c) You must report under subpart C of this part (General Stationary Fuel Combustion Sources) the emissions of CO_2, CH_4, and N_2O from each stationary combustion unit associated with the landfill gas destruction device, if present, by following the requirements of subpart C of this part.

§ 98.463 Calculating GHG emissions.

(a) For each industrial waste landfill subject to the reporting requirements of this subpart, calculate annual modeled CH_4 generation according to the applicable requirements in paragraphs (a)(1) through (a)(3) of this section. Apply Equation TT–1 of this section for each waste stream disposed of in the landfill and sum the CH_4 generation rates for all waste streams disposed of in the landfill to calculate the total annual modeled CH_4 generation rate for the landfill.

(1) Calculate annual modeled CH_4 generation using Equation TT–1 of this section.

$$G_{CH4} = \left[\sum_{x=S}^{T-1}\left\{W_x \times DOC_x \times MCF \times DOC_F \times F \times \frac{16}{12} \times \left(e^{-k(T-x-1)} - e^{-k(T-x)}\right)\right\}\right] \quad \text{(Eq. TT-1)}$$

Where:

G_{CH4} = Modeled methane generation in reporting year T (metric tons CH_4).
X = Year in which waste was disposed.
S = Start year of calculation. Use the year 1960 or the opening year of the landfill, whichever is more recent.
T = Reporting year for which emissions are calculated.
W_X = Quantity of waste disposed in the industrial waste landfill in year X from measurement data and/or other company records (metric tons, as received (wet weight)).
DOC_X = Degradable organic carbon for waste disposed in year X from Table TT–1 to this subpart or from measurement data [as specified in paragraph (a)(3) of this section], if available [fraction (metric tons C/metric ton waste)].
DOC_F = Fraction of DOC dissimilated (fraction); use the default value of 0.5. If measured values of DOC are available using the 60-day anaerobic biodegradation test procedure identified in §98.464(b)(4)(i), use a default value of 1.0.
MCF = Methane correction factor (fraction). Use the default value of 1 unless there is active aeration of waste within the landfill during the reporting year. If there is active aeration of waste within the landfill during the reporting year, use either the default value of 1 or select an alternative value no less than 0.5 based on site-specific aeration parameters.
F = Fraction by volume of CH_4 in landfill gas (fraction, dry basis, corrected to 0% oxygen). If you have a gas collection system, use the annual average CH_4 concentration from measurement data for the current reporting year; otherwise, use the default value of 0.5.
k = Decay rate constant from Table TT–1 to this subpart (yr^{-1}). Select the most applicable k value for the majority of the past 10 years (or operating life, whichever is shorter).

(2) *Waste stream quantities.* Determine annual waste quantities as specified in paragraphs (a)(2)(i) through (ii) of this section for each year starting with January 1, 1960 or the year the landfills first accepted waste if after January 1, 1960, up until the most recent reporting year. The choice of method for determining waste quantities will vary according to the availability of historical data. Beginning in the first emissions reporting year (2011 or later) and for each year thereafter, use the procedures in paragraph (a)(2)(i) of this section to determine waste stream quantities. These procedures should also be used for any year prior to the first emissions reporting year for which the data are available. For other historical years, use paragraph (a)(2)(i) of this section, where waste disposal records are available, and use the procedures outlined in paragraph (a)(2)(ii) of this section when waste disposal records are unavailable, to determine waste stream quantities. Historical disposal quantities deposited (*i.e.*, prior to the first year in which monitoring begins) should only be determined once, as part of the first annual report, and the same values should be used for all subsequent annual reports, supplemented by the next year's data on new waste disposal.

(i) Determine the quantity of waste (in metric tons as received, *i.e.*, wet weight) disposed of in the landfill separately for each waste stream by any one or a combination of the following methods.

(A) Direct mass measurements.

(B) Direct volume measurements multiplied by waste stream density determined from periodic density measurement data or process knowledge.

(C) Mass balance procedures, determining the mass of waste as the difference between the mass of the process inputs and the mass of the process outputs.

(D) The number of loads (*e.g.*, trucks) multiplied by the mass of waste per load based on the working capacity of the container or vehicle.

(ii) Determine the historical disposal quantities for landfills using the Waste Disposal Factor approach in paragraphs (a)(2)(ii)(A) and (B) of this section when historical production or processing data are available. If production or processing data are available for a given year, you must use Equation TT–3 of this section for that year. Determine historical disposal quantities using the method specified in paragraph (a)(2)(ii)(C) of this section when historical production or processing data are not available, and for waste streams received from an off-site facility when historical disposal quantities cannot be determined using the methods specified in paragraph (a)(2)(i) of this section.

(A) *Determining Waste Disposal Factor:* For each waste stream disposed of in the landfill, calculate the average

waste disposal rate per unit of production or unit throughput using all available waste quantity data and corresponding production or processing rates for the process generating that waste or, if appropriate, the facility, using Equation TT–2 of this section.

$$WDF = \left[\sum_{x=Y_1}^{Y_2} \left\{ \frac{W_x}{N \times P_x} \right\} \right] \qquad \text{(Eq. TT-2)}$$

Where:

WDF = Average waste disposal factor as determined for the first annual report required for this industrial waste landfill (metric tons per production unit).

X = Year in which waste was disposed. Include only those years for which disposal and production data are both available; the years do not need to be sequential.

Y_1 = First year in which disposal and production/throughput data are both available.

Y_2 = First year for which GHG emissions from this industrial waste landfill must be reported.

N = Number of years for which disposal and production/throughput data are both available.

W_x = Quantity of waste placed in the industrial waste landfill in year X from measurement data and/or other company records (metric tons, as received (wet weight)).

P_x = Quantity of product produced or feedstock entering the process or facility in year X from measurement data and/or other company records (production units). You must use the same basis for all years in the calculation. That is, P_x must be determined based on production (quantity of product produced) for all ''N'' years or P_x must be determined based on throughput (quantity of feedstock) for all ''N'' years.

(B) *Calculate waste:* For each waste stream disposed of in the landfill, calculate the waste disposal quantities for historic years in which direct waste disposal measurements are not available using historical production data and Equation TT–3 of this section.

$$W_x = WDF \times P_x \qquad \text{(Eq. TT-3)}$$

Where:

X = Historic year in which waste was disposed.

W_x = Calculated quantity of waste placed in the landfill in year X (metric tons).

WDF = Average waste disposal factor from Equation TT–2 of this section (metric tons per production unit).

P_x = Quantity of product produced or feedstock entering the process or facility in year X from measurement data and/or other company records (production units). You must use the same basis for P_x (either production only or throughput only) as used to determine WDF in Equation TT–2 of this section.

(C) For any year in which historic production or processing data are not available such that historic waste quantities cannot be estimated using Equation TT–3 of this section, calculate an average annual bulk waste disposal quantity using either Equation TT–4a of this section when data are available consecutively for the most recent disposal years or Equation TT–4b of this section when data are available for sporadic (non-consecutive) years.

$$W_x = \frac{LFC}{(YrData - YrOpen + 1)} \qquad \text{(Eq. TT-4a)}$$

Where:

W_X = Quantity of waste placed in the landfill in year X (metric tons, wet basis). This annual bulk waste disposal quantity applies for all years from ''YrOpen'' to ''YrData'' inclusive.

LFC = Capacity of the landfill used (or the total quantity of waste-in-place) at the end of the ''YrData'' from design drawings or engineering estimates (metric tons). For closed landfills for which waste quantity data are not available, use the landfill's design capacity.

YrData = The year prior to the year when waste disposal data are first available for all subsequent years from company records or from Equation TT–3 of this section. For landfills for which waste quantity data are not available, the year in which the landfill last received waste.

YrOpen = Year 1960 or the year in which the landfill first received waste from company records, whichever is more recent. If no data are available for estimating

YrOpen for a closed landfill, use 1960 as the default ''YrOpen'' for the landfill.

$$W_x = \frac{WIP - \sum_{n-1}^{NYrData} W_{meas,n}}{(YrLast - YrOpen + 1 - NYrData)} \qquad \text{(Eq. TT-4b)}$$

Where:

W_X = Quantity of waste placed in the landfill in year X (metric tons, wet basis). This annual bulk waste disposal quantity applies for all years for which waste quantity data are not available from company records or from Equation TT–3 of this section.

WIP = Quantity of waste in-place at the start of the reporting year from design drawings or engineering estimates (metric tons). For closed landfills for which waste in-place quantities are not available, use the landfill's design capacity.

$W_{meas,n}$ = Annual quantity of waste placed in the landfill for the nth measurement year from company records or from Equation TT–3 of this section.

YrLast = The last year, prior to the reporting year, that the landfill received waste.

YrOpen = Year 1960 or the year in which the landfill first received waste from company records, whichever is more recent. If no data are available for estimating YrOpen for a closed landfill, use 1960 as the default ''YrOpen'' for the landfill.

NYrData = The number of years for which annual waste disposal quantities are available from company records or from Equation TT–3 of this section from YrOpen to YrLast inclusive.

(3) *Degradable organic content (DOC).* For any year, X, in Equation TT–1 of this section, use either the applicable default DOC values provided in Table TT–1 of this subpart or determine values for DOC_x as specified in paragraphs (a)(3)(i) through (iv) of this section. When developing historical waste quantity data, you may use default DOC values from Table TT–1 of this subpart for certain years and determined values for DOC_x for other years. The historical values for DOC or DOC_x must be developed only for the first annual report required for the industrial waste landfill; and used for all subsequent annual reports (*e.g.*, if DOC for year x=1990 was determined to be 0.15 in the first reporting year, you must use 0.15 for the 1990 DOC value for all subsequent annual reports).

(i) For the first year in which GHG emissions from this industrial waste landfill must be reported, determine the DOC_x value of each waste stream disposed of in the landfill no less frequently than once per quarter using the methods specified in §98.464(b). Calculate annual DOC_x for each waste stream as the arithmetic average of all DOC_x values for that waste stream that were measured during the year.

(ii) For subsequent years (after the first year in which GHG emissions from this industrial waste landfill must be reported), either use the DOC_x of each waste stream calculated for the most recent reporting year for which DOC values were determined according to paragraph (a)(3)(i) of this section, or determine new DOC values for that year following the requirements in paragraph (a)(3)(i) of this section. You must determine new DOC values following the requirements in paragraph (a)(3)(i) of this section if changes in the process operations occurred during the previous reporting year that can reasonably be expected to alter the characteristics of the waste stream, such as the water content or volatile solids concentration. Should changes to the waste stream occur, you must revise the GHG Monitoring Plan as required in §98.3(g)(5)(iii) and report the new DOC_x value according to the requirements of §98.466.

(iii) If DOC_x measurement data for each waste stream are available according to the methods specified in §98.464(b) for years prior to the first year in which GHG emissions from this industrial waste landfill must be reported, determine DOC_x for each waste stream as the arithmetic average of all DOC_x values for that waste stream that were measured in Year X. A single

measurement value is acceptable for determining DOC_x for years prior to the first reporting year.

(iv) For historical years for which DOC_x measurement data, determined according to the methods specified in § 98.464(b), are not available, determine the historical values for DOC_x using the applicable methods specified in paragraphs (a)(3)(iv)(A) and (B) of this section. Determine these historical values for DOC_x only for the first annual report required for this industrial waste landfill; historical values for DOC_x calculated for this first annual report should be used for all subsequent annual reports.

(A) For years in which waste stream-specific disposal quantities are determined (as required in paragraphs (a)(2)(ii)(A) and (B) of this section), calculate the average DOC value for a given waste stream as the arithmetic average of all DOC measurements of that waste stream that follow the methods provided in § 98.464(b), including any measurement values for years prior to the first reporting year and the four measurement values required in the first reporting year. Use the resulting waste-specific average DOC value for all applicable years (*i.e.*, years in which waste stream-specific disposal quantities are determined) for which direct DOC measurement data are not available.

(B) For years for which bulk waste disposal quantities are determined according to paragraphs (a)(2)(ii)(C) of this section, calculate the weighted average bulk DOC value according to the following: Calculate the average DOC value for each waste stream as the arithmetic average of all DOC measurements of that waste stream that follows the methods provided in § 98.464(b) (generally, this will include only the DOC values determined in the first year in which GHG emissions from this industrial waste landfill must be reported); calculate the average annual disposal quantity for each waste stream as the arithmetic average of the annual disposal quantities for each year in which waste stream-specific disposal quantities have been determined; and calculate the bulk waste DOC value using Equation TT–5 of this section. Use the bulk waste DOC value as DOC_x for all years for which bulk waste disposal quantities are determined according to paragraphs (a)(2)(ii)(C) of this section.

$$DOC_{bulk} = \frac{\sum_{n=1}^{N}\left(DOC_{ave,n} \times W_{ave,n}\right)}{\sum_{n=1}^{N} W_{ave,n}} \qquad \text{(Eq. TT-5)}$$

Where:

DOC_{bulk} = Degradable organic content value for bulk historical waste placed in the landfill (mass fraction).

N = Number of different waste streams placed in the landfill.

n = Index for waste stream.

$DOC_{ave,n}$ = Average degradable organic content value for waste stream ''n'' based on available measurement data (mass fraction).

$W_{ave,n}$ = Average annual quantity of waste stream ''n'' placed in the landfill for years in which waste stream-specific disposal quantities have been determined (metric tons per year, wet basis).

(b) For each landfill, calculate CH_4 generation (adjusted for oxidation in cover materials) and CH_4 emissions (taking into account any CH_4 recovery, if applicable, and oxidation in cover materials) according to the applicable methods in paragraphs (b)(1) through (b)(3) of this section.

(1) For each landfill, calculate CH_4 generation, adjusted for oxidation, from the modeled CH_4 (G_{CH_4} from Equation TT–1 of this section) using Equation TT–6 of this section.

$$MG = G_{CH4} \times (1 - OX) \qquad \text{(Eq. TT-6)}$$

Where:

MG = Methane generation, adjusted for oxidation, from the landfill in the reporting year (metric tons CH_4).

G_{CH_4} = Modeled methane generation rate in reporting year from Equation TT–1 of this section (metric tons CH_4).

OX = Oxidation fraction from Table HH–4 of subpart HH of this part.

(2) For landfills that do not have landfill gas collection systems operating during the reporting year, the CH_4 emissions are equal to the CH_4 generation (MG) calculated in Equation TT–6 of this section.

(3) For landfills with landfill gas collection systems in operation during any portion of the reporting year, perform all of the calculations specified in paragraphs (b)(3)(i) through (iv) of this section.

(i) Calculate the quantity of CH_4 recovered according to the requirements at § 98.343(b).

(ii) Calculate CH_4 emissions using the Equation HH–6 of § 98.343(c)(3)(i), except use G_{CH_4} determined using Equation TT–1 of this section in Equation HH–6 of § 98.343(c)(3)(i).

(iii) Calculate CH_4 generation (MG) from the quantity of CH_4 recovered using Equation HH–7 of § 98.343(c)(3)(ii).

(iv) Calculate CH_4 emissions from the quantity of CH_4 recovered using Equation HH–8 of § 98.343(c)(3)(ii).

[75 FR 39773, July 12, 2010, as amended at 76 FR 73907, Nov. 29, 2011; 78 FR 71979, Nov. 29, 2013]

§ 98.464 Monitoring and QA/QC requirements.

(a) For calendar year 2011 monitoring, the facility may submit a request to the Administrator to use one or more best available monitoring methods as listed in § 98.3(d)(1)(i) through (iv). The request must be submitted no later than October 12, 2010 and must contain the information in § 98.3(d)(2)(ii). To obtain approval, the request must demonstrate to the Administrator's satisfaction that it is not reasonably feasible to acquire, install, and operate a required piece of monitoring equipment by January 1, 2011. The use of best available monitoring methods will not be approved beyond December 31, 2011.

(b) For each waste stream placed in the landfill during the reporting year for which you choose to determine volatile solids concentration and/or a waste stream-specific DOC_X, you must collect and test a representative sample of that waste stream using the methods specified in paragraphs (b)(1) through (b)(4) of this section, as applicable.

(1) Develop and follow a sampling plan to collect a representative sample (in terms of composition and moisture content) of each waste stream placed in the landfill for which testing is elected.

(2) Determine the percent total solids and the percent volatile solids of each sample following Standard Method 2540G ''Total, Fixed, and Volatile Solids in Solid and Semisolid Samples'' (incorporated by reference; *see* § 98.7).

(3) For the purposes of § 98.460(c)(2)(xii), the volatile solids concentration (weight percent on a dry basis) is the percent volatile solids determined using Standard Method 2540G ''Total, Fixed, and Volatile Solids in Solid and Semisolid Samples'' (incorporated by reference; see § 98.7).

(4) Determine DOC value of a waste stream by either using at least a 60-day anaerobic biodegradation test as specified in paragraph (b)(4)(i) of this section or by estimating the DOC value based on the total and volatile solids measurements as specified in paragraph (b)(4)(ii) of this section.

(i) Perform an anaerobic biodegradation test and determine the DOC value of a waste stream following the procedures and requirements in paragraphs (b)(4)(i)(A) through (E) of this section.

(A) You may use the procedures published by a consensus-based standards organization to conduct a minimum of a 60-day anaerobic biodegradation test. Consensus-based standards organizations include, but are not limited to, the following: ASTM International (100 Barr Harbor Drive, P.O. Box CB700, West Conshohocken, Pennsylvania 19428–B2959, (800) 262–1373, *http://www.astm.org*), the American National Standards Institute (ANSI, 1819 L Street, NW., 6th floor, Washington, DC 20036, (202) 293–8020, *http://www.ansi.org*), the American Society of Mechanical Engineers (ASME, Three Park Avenue, New York, NY 10016–5990, (800) 843–2763,